

## **MAC 112 MACHINING TECHNOLOGY II**

### **COURSE DESCRIPTION:**

Prerequisites: MAC 111

Corequisites: None

This course provides additional instruction and practice in the use of precision measuring tools, lathes, milling machines, and grinders. Emphasis is on setup and operation of machine tools, including the selection and use of work-holding devices, speeds, feeds, cutting tools, and coolants. Upon completion, students should be able to perform basic procedures on precision grinders and advanced operations of measuring, layout, drilling, sawing, turning, and milling. Course Hours Per Week: Class, 2. Lab, 12. Semester Hours Credit, 6.

### **COURSE OBJECTIVES:**

Upon completion of this course the student will be able to:

- a. Follow safety rules and regulations in the shop.
- b. Select and use semi-precision tools.
- c. Select and use precision tools.
- d. Layout work pieces.

In addition to the above objectives and depending upon module assignments, the student will be able to perform one or more of the following:

### **OUTLINE OF INSTRUCTION:**

- I. Measuring Methods
  - A. Semi-precision measuring tools
    - 1) Measure with a machinist scale to an accuracy of .015"
    - 2) Use dividers to transfer measurements, lay out radii and arcs
    - 3) Use combination square set to layout straight or angle lines and to find the center of round stock
    - 4) Scribe parallel lines, transfer measurements, and find the center of round stock using the hermaphrodite caliper
    - 5) Use surface gage on surface plate to scribe and measure lines on a vertical surface
  - A. Precision measuring tools
    - 1) Read a micrometer to an accuracy of .0001 " (vernier micrometer)
    - 2) Measure inside and outside diameters using spring calipers and transfer these measurements using micrometers

- 3) Measure inside diameter of hole using telescoping gages and transfer these measurements using micrometers
  - 4) Measure the depths of holes, slots, and grooves using a depth micrometer
  - 5) Use the surface plate and vernier height gage to inspect for runout, flatness, squareness and dimensional accuracy
  - 6) Use a dial indicator and precision gage blocks to inspect workpieces
  - 7) Use a vernier caliper and read dimensions to an accuracy of .001"
- II. Bench work
- A. Layout lines for drilling, milling and turning
  - B. Filing
    - 1) Remove burrs and parts using file or deburring tool
  - C. Hacksaw
    - 1) Use hand hacksaw to cut metal within 1/64" of scribed lines
  - A. Threading
    - 1) Thread holes using taps and tap wrench
    - 2) Thread round stock using dies and diestock
- III. Power saw operation
- A. Horizontal Band Saw
    - 1) Use horizontal band saw to cut rough stock of various shapes, to length using proper coolant
    - 2) Install blade with proper tension and set feed
  - A. Vertical Band Saw
    - 1) Weld band saw blades using welding attachment and test by bending
    - 2) Cut layout contours, circles and straight lines on band saw
    - 3) Select proper blade and speed for material to be sawed
    - 4) Install blade on band saw, adjusting guides, and blade tension
    - 5) Fold up blade for storage
- IV. Drill press operations
- A. Drill grinding
    - 1) Sharpen drill bite to correct angles and reliefs for various metals using drill grinder
    - 2) Sharpen drill bits to correct angles and reliefs for various metals by freehand method using pedestal grinder
  - A. Sensitive drill press
    - 1) Make setups for drilling round stock, flat stock, sheet metal and irregular shapes, using proper work-holding devices
    - 2) Drill holes in different types of metals, using proper speeds and feeds as computed from surface speed
    - 3) Drill to different predetermined depths using depth stop
    - 4) Counterbore, countersink, and spotface drilled holes, using proper tools, and controlling depth
    - 5) Ream holes using proper undersized drill prior to reaming, using proper speed and feed for reaming

- V. Arbor press - Use arbor press for broaching and pressing parts on and off mandrels
- VI. Engine lathe
  - A. Setup
    - 1) Clean and mount chucks using wooden board or cradle to protect lathe ways
    - 2) Determine proper speeds and feeds for particular materials and lathe operations
    - 3) Grind single point and forming tools
    - 4) Select and mount correct tools and accessories
  - B. Operations
    - 1) Perform the operations of facing, parting (cutting-off) chamfering, making square and filleted shoulders using proper cutting tool bits
    - 2) Use four-jaw (independent) chuck and dial indicator in performing lathe operations
    - 3) Use collet chuck to perform lathe operations
    - 4) Use combination drill and countersink (center drill) to prepare workplace for drilling and turning between centers
    - 5) Perform lathe operations between centers
    - 6) Perform knurling operations with distinct and proper pattern
    - 7) Perform operations using mandrel between centers
    - 8) Drill and ream holes using tailstock and appropriate depth checking device
    - 9) Use a boring tool assembly to enlarge holes
    - 10) Thread external right and left hand threads using a hand ground single point cutting tool
    - 11) Thread internal right and left hand threads using a hand ground single point cutting tool
    - 12) Turn tapers using the compound rest and taper attachment
    - 13) Finish stock on the lathe using files and abrasive cloth
    - 14) Deburr stock properly using files and form tools
    - 15) Perform drilling and boring operations on a face plate
- VII. Vertical milling machine
  - A. Setup
    - 1) Select and mount proper cutters for the type of material and for the operations to be performed
    - 2) Use proper work-holding devices
    - 3) True workpiece and vise using dial indicator
    - 4) Use dial indicator to find the center of pins or holes
    - 5) Use edgefinder to locate the edge of a workpiece with respect to the centerline of the spindle
    - 6) Adjust speeds and feeds for type of cutter and material
  - A. Operations
    - 1) Drill, counterbore, and bore using proper attachments and cutting tools
    - 2) Square stock using proper methods and end mills
    - 3) Mill key ways
    - 4) Mill keyseats using Woodruff key cutters
    - 5) Index using the superspacer

- 6) Mill angles using swivel vises, fixtures, or by turning or tilting the workpiece or machine head

#### VIII. Horizontal milling machine

##### A. Setup

- 1) Select proper cutters for materials and type of milling
- 2) Install and remove setups using necessary arbors, cutters, work-holding devices and/or adapters
- 3) True the workpiece and/or holding device using dial indicator
- 4) Determine the proper speeds and feeds for the type of milling operation to be performed and for the material to be used
- 5) Locate cutters by the use of machine dials

##### A. Operations

- 1) Square stock using straddle milling
- 2) Mill flat surfaces using a slab milling cutter
- 3) Mill spur gear teeth using the dividing head (indexing)
- 4) Mill slots using side milling cutters and slitting saws
- 5) Mill V's using angle milling cutters

#### IX. Surface grinder (manual and automatic)

##### A. Setup

- 1) Dress grinding wheel using diamond tipped dresser
- 2) Clamp workpiece using magnetic chuck and blocking up workpiece
- 3) Select appropriate grinding wheel, mounting wheel, and observe grinding wheel cutting technology

##### B. Operations

- 1) Operate machine controls
- 2) Grind workpiece to specification

### **REQUIRED TEXTBOOKS AND MATERIALS:**

Kibbe, et al. Machine Tool Practice. 7<sup>th</sup> ed.

Suggested references, periodicals, and visual aids to be announced.

### **STATEMENT FOR STUDENTS WITH DISABILITIES:**

Students who require academic accommodations due to any physical, psychological, or learning disability are encouraged to request assistance from a disability services counselor within the first two weeks of class. Likewise, students who potentially require emergency medical attention due to any chronic health condition are encouraged to disclose this information to a disability services counselor within the first two weeks of class. Counselors can be contacted by calling 686-3652 or by visiting the Student Development Office in the Phail Wynn Jr. Student Services Center, room 1309.